Historical Sources, Labour Figures and Ancient Stone Working Costs

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There can be little doubt that huge amounts of time and labour went into the production of architectural stone-work for ancient building projects, but what can we say about the cost of architectural carving? Occasionally ancient costs of individual architectural elements are preserved, but this is rare, making comparisons difficult.[1] The most obvious response to this problem, of course, is to think of cost not as a monetary figure but in terms of labour input expressed in man-hours.[2] To-date, a considerable amount of research on the economics of ancient building has made use of 19th-century building manuals.[3] This paper highlights a number of issues regarding their application in determining labour figures for Roman stone-working.

First and foremost, it is difficult to retrieve and apply the correct labour constants due to the minutiae of tables, archaic language and lack of explanations. It is clear that Pegoretti's manual, for example, assumes a level of specialist knowledge – i.e. a marble block intended for use in an ashlar wall if sawn at the roughing-out stage (*sbozzatura grossolana*) can pass straight to flat chisel work (*cesellatura*) for fine chisel work or rubbing (*orsatura*) for the first phase of polishing (*pulimento a lucido*); in contrast, a block roughed-out by hand, however, will have to pass through preparatory dressing (*apparecchio o taglio rustico*) with a point chisel and tooth chisel and bush hammer work (*martellinatura o gradinatura grossolana*); equally a block destined for polishing would not be worked with the bush hammer, since it might bruise the stone.[4] These choices would have been second nature to ancient (and post-antique) stone-carvers, but none of this is explained by Pegoretti; however, the inclusion or exclusion of these tasks in generating labour figures can affect the overall economic results.

Equally, the conversion of these labour figures into real data about ancient construction is not straightforward. The resultant man-hours can be converted into *denarii*, for example, using figures provided in Diocletian's Price Edict[5], or other commodities, such as *kastrenses modii* (KM) of wheat.[6] Here, labour costs can meaningfully compare the approximate costs of large-scale imperial buildings with other kinds of state or imperial expenditure. DeLaine's total outlay of 12–14 million KM of wheat on building the Baths of Caracalla was relatively small, by one if not two orders of magnitude, when compared to the 44–150 million KM that was paid out annually to the army.[7] A further option is to examine the economic implications of different types of architectural stone-work by examining the labour differentials in order to establish ratios of cost and the economic repercussions of different architectural stone. If we look at the figures for 20, 30, 40 and 50 Roman foot (RF) monolithic shaft in granodiorite we can see the impact of each 10 RF increase – 684 man-days for a 20 RF column, 1,024 man-days for a 30 RF column, 1,368 man-days for a 40 RF column, and 1,708 man-days for a 50 RF column.[8] These figures

demonstrate that each additional 10 RF added roughly 340 man-days to the carving time in addition to the added difficulties associated with transporting and erecting columns of these sizes. Moreover, an investigation into the working costs of carving column shafts in different materials can reveal the economic impact of the shift from Late Republican temples executed in tufa to the fluted columns of white marble of the Augustan Age to the monolithic granite columns of the 2nd century AD. Using Pegoretti's figures for quarrying, roughing out, dressing and fluting, we see that a monolithic column shaft, 20 RF in length, in tufa would have taken a single carver roughly 48 man-days to complete, while a fluted column in a hard white marble would have taken the same carver 123 man-days. Finally, it would have taken a single carver 684 man-days to carve a smooth granodiorite column. These figures demonstrate among other things that, as would be expected, the different labour requirements between materials are significant. The gap between the costs of these three columns would have been further expanded based on the additional impact of sourcing and transporting these materials, with granodiorite costing a great deal more than tufa or even white marble. In this way, we can readily comprehend the economic impact of the developments in Rome from the mid-Republic with temples, such as Temple C (possibly identified as the Temple of Feronia) in Largo Argentina with its 14 peperino columns, to the marble upgrades in the Augustan period, such as the Temple of Mars Ultor (completed 2 BC) in the Forum of Augustus, or the Temple of Castor in the Roman Forum (AD 6–7), and finally to the spectacular columnar displays of later temples like the Pantheon.

Overall, this paper explores how 19th-century building manuals have been and can be used to better understand the economic implications of ancient construction. This paper, while reaffirming the usefulness of such sources, and consequently, the usefulness of this approach for the quantification of the economics of Roman construction, has also demonstrated some of the failings of these sources. Misinterpretation can lead to erroneous conclusions about the labour and, consequently the costs involved in the production of architectural ornamentation. These manuals, therefore, should be used with caution and alongside other forms of evidence. That being said, 19th-century building manuals in general, and Pegoretti's manual in particular, are important and useful resources for understanding ancient building projects in terms of how they relate to other aspects of the ancient economy and in assessing their broader economic implications.

Notes

[1] On this point, see Duncan-Jones 1982, 64.

[2] For a discussion, see DeLaine 2017. For approaches to labour figures for stone-working, see Barker – Russell 2012.

[3] The key text and standard reference point is Pegoretti 1843–1844.

[4] See Barker – Russell 2012, 87.

[5] Such as the calculations for the marble elements of the Julio-Claudian Temple of Augustus in the forum at Tarraco; Mar – Pensabene 2010.

[6] For this approach, see DeLaine 1997.

[7] DeLaine 1997, 221.

[8] Labour estimates for carving work relevant to the production of a column shaft in man-hours can be found in Pegoretti 1843–1844, 240–336.

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